CLAIMS

What is claimed is:

1. A ruggedized optical rearrangement device comprising:

an input side including at least first and second separate, flexible input light guide arrays, each of the arrays including a plurality of light guides;

a transition region in which the light guides of the at least first and second input light guide arrays are repositioned to form at least first and second separate, flexible output light guide arrays which extend from an output side;

a tube positioned between the input and output sides to protect the transition region of the plurality of light guides;

first and second adapters positioned respectively at each end of the tube;

at least one flexible strength element connected to at least one of the first and second adapters and connected to at least one of the light guide arrays to prevent damage to the light guides.

2. The optical rearrangement device according to claim 1, wherein the tube comprises a cylindrical flexible crush resistant body which contains the plurality of light guides therein.

3. The optical rearrangement device according to claim 1, wherein the first and second adapters each include a hollow body which engages the tube, and wherein the light guide arrays pass through the hollow body.

4. The optical rearrangement device according to claim 3, wherein the strength element includes at least one yarn which passes into the hollow body and is connected with at least one of the light guide arrays.

5. The optical rearrangement device according to claim 3, wherein the hollow body includes a stepped portion which is positioned within the tube.

6. The optical rearrangement device according to claim 5, wherein the flexible strength element includes at least one yarn, and the device further comprises a clip which connects to the stepped portion of the hollow body to retain the at least one yarn.

7. The optical rearrangement device according to claim 6, wherein the hollow body includes a groove on an outer surface of the stepped portion, and wherein the clip is mounted in the groove.

8. The optical rearrangement device according to claim 1, further comprising at least one jacket which encloses at least one of the light guide arrays, wherein the flexible strength element is connected to at least one of the light guide arrays by the jacket.

9. The optical rearrangement device according to claim 1, wherein the at least one flexible strength element includes separate flexible strength elements which are individually associated with each of the input and output light guide arrays.

10. The optical rearrangement device according to claim 1, wherein the at least one flexible strength element is connected to the first and second adapters and is associated with at least one of the flexible input light guide arrays and at least one of the flexible output light guide arrays to prevent the light guide arrays from disassociating from the optical rearrangement device.

11. The optical rearrangement device according to claim 10, further comprising a first jacket which contains at least one of the input light guide arrays and a second jacket which contains at least one of the output light guide arrays.

12. The optical rearrangement device according to claim 11, wherein the at least one flexible strength element includes at least one yarn having first and second ends.

13. The optical rearrangement device according to claim 12, wherein the first end of the at least one yarn is retained by the first jacket and the second end of the at least one yarn is retained by the second jacket, and wherein the yarn passes through the adapters and the tube.

14. The optical rearrangement device according to claim 1, wherein each of the input and output light guide arrays includes at least one ribbon of light guides.

15. The optical rearrangement device according to claim 1, wherein the at least one strength element comprises at least one yarn.

16. A method of ruggedizing an optical rearrangement device which includes an input side having at least first and second separate, flexible input light guide arrays, each of the arrays including a plurality of light guides, an output side in which the light guides of the at least first and second input light guide arrays are repositioned to form at least first and second separate, flexible output light guide arrays, and a transition region disposed between the input and the output sides for repositioning the light guides, the method comprising:

providing a flexible, crush resistant tube to protect the transition region;

providing a first adapter;

connecting the first adapter to at least one of the first and second ends of the tube at the input and output sides;

connecting at least one strength element to the first adapter; and

connecting the at least one strength element to at least one of the flexible input or output light guide arrays.

17. The method according to claim 16, further comprising providing at least one jacket which at least partially encloses at least one of the light guide arrays, and enclosing at least a portion of the at least one strength element within the jacket to connect the at least one strength element to at least one of the light guide arrays.

18. The method according to claim 16, further comprising providing a second adapter, and wherein the step of connecting the first adapter further includes connecting the second adapter to the other of the first and second ends of the tube at the input and output sides.

19. The method according to claim 18, further comprising connecting the at least one strength element to the second adapter, and connecting the at least one strength element to at least one of the flexible input and one of the flexible output light guide arrays.

20. The method according to claim 19, wherein the step of connecting the at least one strength element includes passing the at least one strength element through the tube within the transition region.

21. The method according to claim 20, further comprising isolating the at least one strength element from the plurality of light guides.

22. The method according to claim 18, wherein the steps of providing the adapters include providing at least one of the adapters with a stepped portion, and placing the stepped portion of at least one of the adapters into the tube to connect the adapter to the tube.

23. The method according to claim 16, further comprising providing a clip for connecting to the first adapter, and attaching the at least one strength element to the first adapter using the clip to connect the at least one strength element to the first adapter.

24. The method according to claim 23, wherein the step of attaching the at least one strength element to the first adapter using the clip includes attaching the clip to a groove in the stepped portion of the first adapter.